IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

Chen, et al.

Serial No.:	10/671,938	**Group Art Unit:**	2161
Filed:	September 29, 2003	**Examiner:**	Kim, P.
For:	SYSTEM AND METHOD FOR MONITORING EVENTS AGAINST CONTINUAL RANGE QUERIES		

Commissioner for Patents
Alexandria, VA 22313-1450

APPELLANTS' BRIEF ON APPEAL

Sir:

Appellants respectfully appeal the rejection of claims 1-20 in the Office Action mailed on November 27, 2006. A Notice of Appeal was timely filed on February 27, 2007.

I. REAL PARTY IN INTEREST

The real party in interest is International Business Machines Corporation, assignee of 100% interest of the above-referenced patent application.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants, Appellants' legal representative or Assignee which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-20 are all the claims presently pending in the application.

Claims 1-20 stand rejected under 35 U.S.C. § 101 as allegedly directed to non-statutory subject matter. Claims 16-19 stand rejected under 35 U.S.C. § 101 as allegedly being lacking utility because claim 16 is worded as being inoperable.

Claim 20 stands rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite.

Claim 9 stands rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Liu et al., "Continual Queries for Internet Scale Event-Driven Information Delivery". Claims 1-4, 6, 7, and 10-15 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Liu, further in view of US Patent 5,915,251 to Burrows et al.

Claims 5, 8, and 16-20 are understood as being allowable over the prior art currently of record, if rewritten in independent format and the rejection for non-statutory subject matter is overcome.

All of the above rejections are being appealed.

IV. STATUS OF AMENDMENTS

An Amendment Under 37 CFR §1.116 was filed on January 29, 2007, in an attempt to address the Examiner's concern for wording for claims 16-19.

In the Advisory Action mailed on February 13, 2007, the Examiner refused to enter this amendment. Therefore, the claims appendix reflects the version in the Amendment Under 37 CFR §1.111 filed on September 6, 2006.

V. SUMMARY OF CLAIMED SUBJECT MATTER

As described and defined in, for example, independent claim 1, the present invention is directed to a method for monitoring continual range queries against events. Each range query is decomposed into one or more predefined virtual constructs. A query index is built, and the query index is used to match an event with the range queries.

The present invention provides a single event monitor for an event space that is accessible to a plurality of queries, including queries that will cause overlapping ranges in

the monitor event region. No method is known to providing a fast matching of events against a large number of queries in such event monitors.

The present invention provides this fast matching for a plurality of queries by breaking each range query down into predefined regions of the monitored event space, referred to in the present invention as "virtual constructs", and providing an index mechanism to relate these virtual constructs to each query for which it had been constructed. This query index provides the fast matching that allows a single event monitor to service a plurality of queries in a plurality of dimensions.

Thus, the present invention is more than simply a mechanism involving continual queries. It is a mechanism that allows a single event space monitor to service many continual queries wherein a fast matching of an event can be reported to the appropriate queries.

As explained, beginning at line 19 on page 2 of the specification, until the present invention, it is been difficult to construct an effective index for multidimensional range predicates, particularly for overlapping ranges. As explained beginning at line 3 on page 3, the only mechanism known to the present inventors involves an R-tree method, and this method degrades when the spatial objects are highly overlapping.

In contrast, the present invention provides an indexing mechanism from the event monitor back to the various queries. This indexing feature is novel to the art of event monitors.

As explained below, the prior art rejection currently of record fails to address the monitoring of a plurality of queries, since the techniques of both these references involve the analysis of a single input query. There is no suggestion (and no need) in these prior art references of attempting to monitor a single event space for more than one input query, let alone input queries having overlapping objects.

Basis of the Claims in the Specification/Figures:

1. (Rejected) A method for monitoring continual range queries against events (line 15 of page1 through line 2 of page 2), said method comprising:

decomposing each range query into one or more predefined virtual constructs (step 204 of Fig. 2);

building a query index (steps 201,205 of Fig. 2;); and

using said query index to match an event with said range queries (step 208 of Fig. 2).

2. (Rejected) The method of claim 1, said building of a query index further comprising:

storing an identification of said query with identification lists associated with said virtual constructs (step 205 of Fig. 1).

3. (Rejected) The method of claim 1, said building of a query index further comprising:

predefining a set of virtual constructs for each point being monitored (step 202 of Fig. 1; lines 19-21 of page 13).

4. (Rejected) The method of claim 1, said matching of an event with said range queries further comprising:

finding all the virtual constructs that cover said event (step 207 of Fig. 1; lines 16-18 of page 13).

5. (Rejected) The method of claim 1, said decomposing of a range query further comprising:

initializing a working rectangle to be said range query (e.g., see VCR:8 in right corner of Fig. 3; lines 21-22 of page 3; step 604 of Fig. 6; line 22 of page 12 through line 2 of page 13);

repeatedly cutting a strip rectangle from said working rectangle (e.g., see VCR:5 and VCR:2 on right side of Fig. 3; step 607 of Fig. 6; lines 6-7 of page 13); and

decomposing said strip rectangle with one or more of said virtual constructs (e.g., see VCR:0, VCR:1, VCR:3, VCR:4, VCR:6, and VCR:7 in Fig. 3; lines 22-24 of page 8).

6. (Rejected) The method of claim 4, wherein a size of the set of covering virtual constructs of an event is constant for all the event points (lines 6-7 of page 14).

7. (Rejected) The method of claim 4, wherein gaps between corresponding different covering virtual constructs of all event points are identical (lines 6-7 of page 14).

8. (Rejected) The method of claim 4, said finding of all covering virtual constructs of an event comprising:

pre-computing of a difference table (line 1 of page 15);

computing an identification of a pivot virtual construct (line 2 of page 15); and

adding said identification of pivot virtual construct to each of the elements stored in said difference table (step 804 of Fig. 8; lines 10-12 of page 15).

9. (Rejected) A method of providing a service of monitoring events or conditions (line 9 of page 16 through line 14 of page 17), said method comprising at least one of the following:

providing a service that monitors events against interests of a customer, said service monitoring said events by decomposing continual range queries related to said customer interests with one or predefined virtual constructs, building a query index, and using said query index to match an event with said range queries (see Fig. 2);

maintaining one or more customer interests expressed as continual range queries for the service that monitors events; and

notifying a subset of said customers whose interests match an event.

10. (Rejected) A system (e.g., see Fig. 1) for monitoring continual range queries against events, said system comprising:

a decomposing module that decomposes each range query into one or more predefined virtual constructs (e.g., step 204 of Fig. 2);

a query index construction module (e.g., steps 201, 205 of Fig. 2); and

an event matching module that uses said query index to match an event with said range queries (e.g., step 208 of Fig. 2).

11. (Rejected) The system of claim 10, further comprising:

at least one sensor (101, 102 of Fig. 1) to detect occurrence of events.

12. (Rejected) The system of claim 10, further comprising:

at least one client input station (111, 112 of Fig. 1; line 7 of page 7) to permit a client to provide an input query.

13. (Rejected) The system of claim 10, further comprising:

at least one client receiver (111, 112 of Fig. 1; line 7 of page 7) to permit a client to be notified of occurrence of an event of interest.

14. (Rejected) An apparatus for monitoring continual range queries against events, said apparatus comprising one of:

a query monitor that includes:

a decomposing module that decomposes each range query into one or more predefined virtual constructs (e.g., see step 204 of Fig. 2);

a query index construction module (e.g., see steps 201, 205 of Fig. 2); and

an event matching module that uses said query index to match an event with said range queries (e.g., see step 208 of Fig. 2);

a sensor (101, 102 of Fig. 1; lines 4-5 of page 7to detect occurrence of events and provides said occurrence of events into said query monitor;

a client receiver (111, 112 of Fig. 1; line 7 of page 7) to permit a client to be notified of occurrence of an event of interest to said client.

15. (Rejected) A signal-bearing medium (e.g., 1000 of Fig. 10) tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus to perform a method for monitoring continual range queries against events, said method comprising:

decomposing each range query into one or more predefined virtual constructs (e.g., step 204 of Fig. 2);

building a query index (e.g., step 201 of Fig. 2); and

using said query index to match an event with said range queries (e.g., step 208 of Fig. 2).

16. (Rejected) The method of claim 1, wherein said event is monitored by scanning points in an event space having at least one dimension (see monitoring area 400 of Fig. 4; line 16 of page 10), and said predefined virtual constructs comprise rectangular objects in said event space (e.g., 401 of Fig. 4; lines 14-15 of page 10).

17. (Rejected) The method of claim 16, wherein dimensional ratios of said predefined virtual constructs are based on powers of 2 relative to a dimension of said event space (line 23 of page 9).

18. (Rejected) The method of claim 1, wherein each said predefined virtual construct is identified as based on a location of a corner of said virtual construct in a monitored region of said event space and at least one dimension of said virtual construct (lines 10-13 of page 8, line 4 of page 10 through line 21 of page 11).

19. (Rejected) The method of claim 18, wherein an identification of each said predefined virtual construct is calculated to be an integer, the calculations for said integer being based at least in part on said location and said at least one dimension (lines 13-15 of page 8; line 4 of page 10 through line 21 of page 11).

20. (Rejected) The method of claim 1, wherein said decomposing each range to determine said one or more predefined virtual constructs comprises generating a set of working rectangles in an event space that become progressively smaller in size (e.g., see Fig. 3; lines 5-7 of page 12).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellants present the following grounds for review by the Board of Patent Appeals and Interferences:

GROUND 1: THE STATUTORY SUBJECT MATTER REJECTION BASED ON 35 USC §101 FOR CLAIMS 1-20;

GROUND 2: THE STATUTORY SUBJECT MATTER REJECTION BASED ON 35 USC §101 FOR CLAIMS 16-19;

GROUND 3: THE INDEFINITENESS REJECTION BASED ON 35 USC §112, SECOND PARAGRAPH FOR CLAIM 20;

GROUND 4: THE ANTICIPATION REJECTION UNDER 35 USC §102(b) FOR CLAIM 9, AS BASED ON LIU; and

GROUND 5: THE OBVIOUSNESS REJECTION UNDER 35 USC §103(a) FOR CLAIMS 1-4, 6, 7, AND 10-15, AS BASED ON LIU, FURTHER IN VIEW OF BURROWS.

VII. ARGUMENTS

GROUND 1: THE STATUTORY SUBJECT MATTER REJECTION BASED ON 35 USC §101 FOR CLAIMS 1-20

Claims 1-20 stand rejected under 35 U.S.C. §101, because, as best understood, the Examiner reconsiders that there is no tangible result provided by the claimed invention.

In response, Appellants submit that the invention is clearly described in the specification as being executed on a computer (e.g., a machine) and directed to the practical utility of activity/event monitoring and that there is no algorithm that is being preempted by the present invention.

As such, Appellants respectfully submit that the rejection of record uses the wrong legal standard by attempting to categorize all claims together with the "tangible result" test. That is, claims 10-13 are directed to a "system" and claim 14 is directed to an "apparatus." Even in accordance with the new Guidelines, since the present invention is not preempting a mathematical algorithm in the abstract, these claims are, therefore, clearly directed to statutory subject matter by reason of being directed to a "machine", one of the four categories specifically listed in 35 USC §101: "... any new and useful process, machine, manufacture, or composition of matter ...."

Claim 15 is directed toward a computer medium and is, therefore, a Beauregard claim, after *In re Beauregard*, 53 F.3d 1583 (Fed Cir, 1995). In that holding consisting of three paragraphs, the Court announced that the USPTO conceded that such medium claims are statutory subject matter by reason of being an object of manufacture. US Patent 5,710,578 to Beauregard et al. issued on January 20, 1998.

Therefore, Appellants submit that claims 10-15 are clearly directed toward statutory subject matter.

The remaining claims, viewed from the perspective of the description of the specification (and the primary reference Liu), are directed to a computerized method and, in accordance with recent case law and the new Guidelines, are subject to the "useful, concrete and tangible result " test confirmed in *State Street* and *AT&T*. As best

understood, the Examiner considers that "tangible" is the only prong of this test at issue for these method claims.

According to the new Guidelines: *"The tangible requirement does not necessarily mean that a claim must either be tied to a particular machine or apparatus or must operate to change articles or materials to a different state or thing. However, the tangible requirement does require that the claim must recite more than a §101 judicial exception, in that the process claim must set forth a practical application of that §101 judicial exception to produce a real-world result."*

Appellants respectfully submit that the present invention, by being directed to activity/event monitoring, is inherently a real world application, since it uses sensors that detect real world events and the result is an output indicating that an identified event has occurred. Various non-limiting examples were provided beginning at line 15 of page 1 of the specification: ".... activity/event monitoring in various application areas such as business activity monitoring for corporate management, sensor activities monitoring for continual queries, road traffic condition monitoring for traffic control, event matching for pub/sub applications, information monitoring for selective information dissemination, and health activity monitoring for disease outbreaks or bio-attacks."

Moreover, as described in section IV.C.2.b of the new Guidelines (e.g., on page 20 of the hardcopy version): *"In determine whether the claim is for a "practical application," the focus is not on whether the steps taken to achieve a particular result are useful, tangible and concrete, but rather that the final result achieved by the claimed invention is "useful, tangible and concrete."* (emphasis in Guidelines itself)

Applicants respectfully submit that the results discussed above are clearly useful, tangible and concrete.

Therefore, Appellants respectfully submit that the invention defined by method claims 1-9 and 16-20 clearly provides a tangible result, in the sense defined by the new Guidelines and when taken as a whole, and are, therefore, clearly statutory subject matter.

Appellants, therefore, respectfully request that the Board remove this rejection for all claims 1-20.

GROUND 2: THE STATUTORY SUBJECT MATTER REJECTION BASED ON 35 USC §101 FOR CLAIMS 16-19

The Examiner also rejects claims 16-19 as lacking utility because the Examiner considers that a one dimensional event space would lack "rectangles." In response, Appellants direct the Board's attention to the description at lines 14 – 17 of page 7, wherein Appellants specifically noted that the word "rectangle" is intended to mean a geometrical construct in dimensions other than merely two dimensional event spaces. Therefore, a "rectangle" of a one-dimensional event space would be line segments, in the context of the present invention.

Appellants note also that claims 18 and 19 do not make any reference to "rectangle" and, therefore, have no reason to be subject to the Examiner's concern over this claim terminology.

It is further noted that Appellants' attempt to amend claims 16-19, in order to expedite prosecution, to clearly reflect that "rectangles" are intended to refer to constructs in event spaces having dimensions two or higher, was denied by the Examiner as raising a new issue.

Appellants respectfully submit that the proposed claim amendments denied entry by the Examiner were clearly reducing the number of issues for Appeal and were clearly not raising any new issues, since it was the Examiner who raised the issue being addressed without taking into account the description in the specification.

In view of the above discussion, the Examiner is respectfully requested to remove this rejection.

GROUND 3: THE INDEFINITENESS REJECTION BASED ON 35 USC §112, SECOND PARAGRAPH FOR CLAIM 20

Claim 20 stands rejected because the Examiner considers that one having ordinary skill in the art would not understand "... whether the set of working rectangles or the event space become progressively smaller in size."

In response, Appellants direct the Board's attention to the straightforward analysis of the grammatical construction of the final clause of this claim: "... *generating a set of working rectangles in an event space that become progressively smaller in size*" and point out that neither of the Examiner's interpretations is incorrect, based upon the grammatical analysis.

Specifically, Appellants point out that the verb "become" in this clause is plural, thereby establishing that the subject of this clause, which is the pronoun "that", must be referring to a plural noun, since normal English grammar requires agreement between the subject and verb and since pronouns are expected to take on the singular/plural aspect of the noun to which they refer. The only noun in the preceding clause that is plural is "rectangles", thereby clearly establishing that the description relates to "rectangles" that become progressive smaller in size.

Therefore, contrary to the Examiner's interpretations, this description is not referring to a "set ... that becomes progressive smaller in size" or an "event space ... that becomes progressively smaller in size", as would be proper grammar construction for the two interpretations advanced by the Examiner in the rejection.

Moreover, Appellants submit that "progressive smaller in size" has a plain meaning having no confusion to one having ordinary skill in the art, since this claim language is clearly describing that the "rectangles ... become progressively smaller in size."

This feature of the present invention is clearly described in the specification, for example, at lines 5-7 of page 12, and is clearly demonstrated in Figure 3.

Therefore, in view of the above discussion, Appellants submit that there is no confusion about the plain meaning of the language of this claim and respectfully request that the Board remove this rejection.

GROUND 4: THE ANTICIPATION REJECTION UNDER 35 USC §102(b) FOR CLAIM 9, AS BASED ON LIU

The Examiner alleges that Liu teaches the claimed invention described by claim 9. Appellants note that the rejection, as articulated in paragraph 15 on page 4 of the Office Action mailed on November 27, 2006, improperly declares that there is no patentable weight afforded to two claim limitations, since they are optionally recited. In the final paragraph on page 10 of that same Office Action, and continuing onto the next page, the Examiner concedes that these two ignored limitation may have patentable weight but maintains the rejection and considers that the two ignored limitations can be ignored from evaluation since they are described in the alternative.

In response, Appellants agree that optional claim limitations of a plurality of claim limitations may reasonably be ignored if they are separably optional. That is, Appellants respectfully submit that the underlying flaw of the rejection currently of record is that the Examiner fails to recognize that the final two claim limitations actually rely upon the first claim limitation for their respective meaning so that the plain meaning of the first limitation must also be satisfied in the rejection.

More specifically, the second limitation uses the claim terminology "... the service that monitors events", which terminology refers back to the first claim limitation.

Similarly, the third limitation uses the claim terminology "... a subset of said customers ....", which terminology likewise refers back to the first claim limitation.

Thus, Appellants respectfully submit that proper claim construction requires that the first claim limitation cannot simply be ignored, as the rejection of record has done.

In the rejection of record, the Examiner chooses to examine only the second claim limitation and points to the following wording in Liu section 4.4.2: "*... the trigger condition is 'Stock.price (IBM)IncreaseBy% 5 OR Stock.price(Intel)DecreaseBy%5'....*"

However, this trigger condition is not being evaluated by "the service" described in the first claim limitation, which the Examiner concedes in the prior art evaluation for the remaining claims, as described in more detail in the following section discussing the obviousness rejection based on Liu as modified by Burrows. Thus, Appellants respectfully

submit that the rejection of record for this second claim limitation is reliant upon an improper claim construction, since the use of the terminology "the service" in the second limitation requires that this service must satisfy the plain meaning of the claim language of the first claim limitation.

Therefore, Appellants respectfully submit that the rejection currently of record has an underlying deficiency due to improper claim construction and fails to meet the initial burden of a *prima facie* anticipation rejection, and the Board is respectfully requested to remove this rejection.

GROUND 5: THE OBVIOUSNESS REJECTION UNDER 35 USC §103(a) FOR CLAIMS 1-4, 6, 7, AND 10-15, AS BASED ON LIU, FURTHER IN VIEW OF BURROWS

Introduction

The Examiner alleges that Liu, when modified by Burrows, renders obvious claims 1-4, 6, 7, and 10-15. Appellants respectfully submit, however, that there are elements of the claimed invention which are neither taught nor suggested by Liu or by Burrows and that the rejection currently of record is deficient and/or fails to meet the initial burden of a *prima facie* rejection for at least the following four reasons:

1) The **principle of operation** of primary reference Liu differs fundamentally from the principle of operation of the present invention, since Liu simply runs each continuous query to detect an event for that continuous query, whereas the present invention scans a monitored event space shared by a plurality of queries. Modifying Liu to satisfy the plain meaning of the claim language of the independent claims would inherently have to change its principle of operation and would, therefore, be improper. The advantage of the method of the present invention is that many range queries can be monitored simultaneously, rather than having to repetitively exercise each range query.

2) Secondary reference Burrows is **non-analogous art** and, therefore, not properly combinable with primary reference Liu;

3) Even if primary reference Liu were to be modified by secondary reference Burrows, the **resultant combination would not satisfy the plain meaning** of the claim language of even the independent claims. That is, not only does primary reference Liu have an inherently different principle of operation from that of the present invention, but secondary reference Burrow also has a different purpose and a different principle of operation from that necessary to satisfy the language of the independent claims; and

4) There is **no reasonable motivation** to modify primary reference Liu, since the rejection currently of record merely engages in a circular reasoning: the rationale for making the modification is to obtain the benefit of having made the modification. There is

no objective motivation from either of these cited references identified in the rejection of record.

1. Liu Differs Fundamentally from the Present Invention in Principle of Operation

Liu discloses the concept of continual queries as queries that monitor updates of interest and return results whenever an update reaches a specified threshold (see abstract). To achieve this result, Liu employs a scheme wherein an event monitor is created to provide event monitoring specifically for each input query, as evidenced by the discussion in 4.3, wherein is described the definition of a continual query CQ_i as being a triple (Q, T_{cq}, Stop). Thus, in Liu, the event monitor is specific for each query.

This fundamental principle of operation is confirmed by the following description in 2.1 on page 4 of Liu:

"*The first run of Q is performed over past and present data represented by the stat of information sources, and the whole result obtained by executing Q is returned to the user. The subsequent executions of Q are performed whenever a new update event occurs (is signaled) and the trigger condition* T_{cq} *becomes true.... Let us denote the result of running query Q on database state* S_i *as* $Q(S_i)$*. We define the result of running a continual query CQ as a sequence of query answers {* $Q(S_1)$, $Q(S_2)$, ... $Q(S_n)$*} obtained by running query Q on the sequence of database states* S_i, $1 \leq i \leq n$, *at each given state* S_i ($i > 0$), $Q(S_i)$ *is triggered by Teq* $\wedge \neg$ *Stop. The basic events that cause continual queries to fire may be standard database operations such as INSERT, DELETE, UPDATE, or the events that cause clock signals (e.g., check the balance of all bank accounts at 5:00 pm everyday), or any user- or application-generated signals (e.g., a failure signal from a diagnostic routine on a hardware component).*"

Thus, in Liu, each query is continuously (e.g., repetitively) being separately executed to detect if an event occurs, as defined by that continual query. There is no attempt in Liu to discover an event as having occurred as defined by one continual query and then identify which additional queries might also define that event.

The Present Invention Uses a Different Principle of Operation

In contrast to Liu, as shown in Figure 4 of the present Application, the present invention involves a fundamentally different principle of operation in which an event monitor scans an event space that is constructed to service a plurality of queries. That is, the present invention simultaneously monitors all range queries represented in this single monitored event space.

Thus, in the present invention, when an event is detected by this scanning of the monitored space, it is necessary to be able to correlate a detected event in the monitored space with all queries related to that detected event. This correlation is achieved in the present invention by using an indexing mechanism (defined in the independent claims) that correlates the events in the monitored event space with all queries for which the event point in the event space has been created.

Liu operates differently. It simply executes each continual query to detect events defined respectively by that continual query.

In order to convert Liu into a mechanism that satisfies the description of the independent claims, the underlying principle of operation of Liu would have to be changed. Such change in principle of operation is prohibited by the holding in *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA, 1959), as described in MPEP §2143.01: "*If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claim prima facie obvious.*"

Therefore, based on this holding, Appellants respectfully submit that the rejection currently of record fails to meet the initial burden of a *prima facie* rejection.

Liu has no need to correlate events with input queries and such correlation would improperly change its principle of operation and defeat the function of its continuous queries

Since events are actually detected in Liu by running each input query to determine if the monitored event has occurred, the query associated with a detected event is inherently known in Liu. Liu has no mechanism that determines whether an event detected for one continuous query is also an event for another continuous query since detection of an event for a continuous query, by the definition recited above, requires that the continuous query be run.

Therefore, the event-detection mechanism described in Liu teaches against the description in the independent claims to use an index that correlates events with different queries.

Moreover, if the mechanism in Liu were to be modified to incorporate an index between an event detected by running one continuous query to a second continuous query or other continuous queries, as described by the independent claims, then the function of the second continuous query will be defeated. Such modification is improper under the holding in *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir., 1984), as described in MPEP §2143.01: "*If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.*"

Therefore, because the function would inherently be defeated by modifying Liu to satisfy the description of the independent claims and the principle of operation would be changed, as described earlier, Appellants respectfully submit that Liu cannot even serve as the primary reference in evaluating the present invention.

For this reason alone, Appellants submit that the present invention is clearly patentable over Liu.

Liu does not have a query decomposition and does not have the "virtual constructs" of the present invention

Moreover, Appellants submit that the trigger conditions T_{cq} as a parameter in the triple that defines the continual query in Liu fails to satisfy the plain meaning of the claim language, since there is no decomposition step in Liu, as required by the independent claims. This parameter merely defines the range to be monitored by the continual query and there is no need to break this region down further from that defined monitored region. The fact that the range to be monitored involves more than one parameter or consists of more than one range is a concept different from the decomposition step of the present invention. Thus, there does not appear to be anything in Liu that reasonably satisfies this step in the independent claims that requires a decomposition.

In paragraph 18 of the rejection of record, the Examiner attempts to correlate the description at step 1 as a decomposing of the range query (e.g., "*This step is to identify the update events of interest from the trigger condition expression of CQ. It is done by decomposing the trigger condition of Tcq into a list of Tcq triplets, each triple consists of a basic update event, an atomic conditional event, and a connector to the next triple in the list*"). Appellants respectfully submit that this "decomposing" exercise in Liu is clearly described as intending "*... to identify the update events of interest ....*" and is merely a parsing exercise to describe each trigger condition.

This concept differs fundamentally from the virtual constructs of the present invention that is related in the fundamental difference discussed above that Liu must continually run each continual query to detect an event.

That is, as described in dependent 3, the virtual constructs of the range queries resultant from the decomposition defined in independent claim 1 are then correlated with points in the event space being monitored, thereby permitting the simultaneous monitoring of multiple range queries by monitoring points in the monitored space. In contrast, Liu detects events by repetitively executing each continual query.

The advantage of the monitored space concept of the present invention relative to the method of Liu is that the present invention permits many queries to be monitored simultaneously without having to exercise each query to detect events.

Liu does not have any concept related to virtual constructs, particularly as further defined by dependent claim 3. Again, this difference fundamentally distinguishes the present invention from Liu.

2. Secondary Reference Burrows is Non-analogous to Liu and to the Claimed Invention

The Burrows Reference

As described in the Abstract, secondary reference Burrows is related to indexing the contents of a database, not an event space involving continual range queries, as in the present invention, or a continual query method as in Liu. There are no "events" in Burrows, unless one considers the input queries as events.

Moreover, as described in the Abstract, since the indexing mechanism in Burrows is for the database contents, this indexing scheme does not satisfy the plain meaning of the indexing described in the independent claims. That is, there is no suggestion in Burrows to provide an indexing for input queries, as would be required to satisfy the description in the independent claims. Additionally, as pointed out above, such input query index would improperly change the principle of operation of Liu.

In contrast to Liu (and the present invention), Burrows is indexing records. For example, Burrows creates an index into a set of records, each representing a Web page and each has a word and a numeric value. A query in Burrows contains one or more search keywords. The goal is to find all the Web pages containing those keywords. This is a typical search operation conducted by many users of the Web in the present time via a search engine provided by Google, Yahoo, or Microsoft on the Web.

3. The Claimed Invention Does NOT Result EVEN IF Secondary Reference Burrows Were to be Incorporated into Primary Reference Liu

The Examiner concedes that Liu fails to demonstrate a query index (and, indeed, as discussed above, cannot even have such an index without improperly changing the principle of operation of Liu). As described in the Abstract of Burrows, the index mechanism therein is for the database contents, not input queries.

Thus, even if the database indexing scheme of Burrows were to be incorporated into Liu, there would still be missing an index for the input queries in order to satisfy the plain meaning of the claim language of even the independent claims.

4. There is No Motivation to Modify Primary Reference Liu by Secondary Reference Burrows

In paragraph 18 beginning on page 5 of the Office Action mailed on November 27, 2006, the Examiner alleges:

"*Therefore it would have bee[n] obvious to one of ordinary skill in the art at the time the invention was made to modify the invention suggested by LIU by combining it with the invention disclosed by BURROWS. The results of this combination would lead to a method for monitoring continual against events wherein range queries (or trigger conditions) are decomposed into virtual constructs (e.g.,, a list of triplets) and a query index used to match an event with the aforementioned range queries. One of ordinary skill in the art would have been motivated to do this modification so that a query index may be used to match an event with the continual range queries specified by a user.*"

In response, Appellants respectfully submit that this rationale is merely a circular argument that clearly demonstrates improper hindsight.

More important, as discussed above, such modification would improperly change the principle of operation of Liu and would defeat the purpose of running each continual query to detect events associated with that continual query.

Therefore, Liu/Burrows fail to satisfy the plain meaning of the language of the claimed invention, as follows:

Turning now to the clear language of the claims, in Liu there is no teaching or suggestion of: ".... decomposing each range query into one or more predefined virtual constructs; building a query index; and using said query index to match an event with said range queries", as required by independent claim 1. The remaining independent claims contain similar language.

That is, taking the above claim 1 as an example, the Examiner relies upon the query parsing described at lines 57-67 of column 16 and Figure 12 of Burrows as satisfying the first claim limitation. However, Appellants submit that "parsing an input query into query components" fails to satisfy the plain meaning of the claim limitation that requires "... decomposing each range query into one or more predefined virtual constructs ...." Parsing transforms a user query, like searching "apple and orange", into a query tree, which is the AND operation of the result of searching "apple" and the result of searching "orange". The parsing of a user query in Burrows is not related to the decomposing of a continual range query into one or more virtual constructs. That is, parsing is understood in the art as translating a query into a sequence of operations. The decomposing step of the present invention partitions a range into one or more constructs.

The Examiner also points to lines 34-35 of column 25 of Burrows. However, this description relates to dividing the word database, not a range query. A "range" query operation is described at lines 9-19 in column 26 and does not suggest decomposing the exemplary "range" query "... find a word *a* in pages including 57 to 70 words ...." into some type of virtual constructs, let alone virtual constructs characterized by recently-added dependent claims 16-20.

Relative to the second claim limitation, the Examiner points to lines 16-23 of column 2 of Burrows. However, the description at these lines refers to indexing of range-based values of records within the word database and has nothing to do with a query index used to match an event in an event space. Burrows does not build a query index. Furthermore, Burrows has a word entry for each subinterval which includes the range-

based values, and the locations associated with the word entries representing the subintervals are the locations of the range-based portions of information. Even if one can understand what this confusing sentence is about, it is still not remotely related to the query index disclosed in the present invention.

Relative to the final limitation, the Examiner points to Liu section 4.4.2. However, Appellants submit that there is no suggestion in this section concerning a query index. The Examiner also points to lines 53-55 of column 8 and lines 20-21 of column 25 of Burrows. Appellants submit that the description at both of these cited locations relate to size/date attributes of a page of records in the word database and have nothing to do with a query index set up to match events in an event space. The statement "... SIZE and DATE attributes can be searched in Burrows using range-based values" has nothing to do with the matching of an event with the range queries of the present invention. In the present invention, an event, represented as a record, is used to search the query index. Not only is the index in Burrows different from the query index of the present invention, but also the search operation is different.

Appellants submit that this "out-of-context" approach of the rejection for claim 1 fails to analyze the claim language as by one having ordinary skill in the art. Moreover, Appellants submit that the word database query technique in Burrows, as based on indexing the database, is completely non-related to the threshold query method of Liu. Even if Liu were to be combined with Burrows, as explained above, there is no suggestion of decomposing range queries into virtual constructs and building a query index to be used to match queries with events.

The Rejection for Claim 2

Relative to the rejection for claim 2, Appellants submit that even though each query has a unique entity identifier, Liu does not maintain an identification list associated with a virtual construct. Liu does not have virtual constructs. As discussed above, these virtual constructs provide a mechanism so that the present invention can monitor an event space simultaneously for any number of range queries. In contrast, Liu must exercise each continual query to detect events.

The Rejection for Claim 3

Relative to the rejection for claim 3, Appellants submit that the sentence "*There is one word entry for each subinterval which includes the range-based ....*" in Burrows is not related to the concept of this claim. Moreover, as pointed out above, this dependent claim describes the mechanism enabling the present invention to monitor simultaneously any number of range queries without having to repetitively exercise each query, as is done in Liu.

The Rejection for Claim 3

Relative to the rejection for claim 4, Appellants are puzzled why this line is even cited, since it does not appear to be relevant at all. As explained above, the present invention differs fundamentally from Liu in that it simultaneously monitors any number of range queries, whereas Liu must repetitively exercise each continual query. Claim 3 articulates one of the features of this difference.

The Rejections for Claims 6 and 7

Relative to the rejection for claims 6 and 7, Appellants fail to find anything relevant in the cited lines from Liu.

CONCLUSION

In view of the foregoing, Appellants submit that claims 1-20, all the claims presently pending in the application, are clearly enabled and patentably distinct from the prior art of record and in condition for allowance. Thus, the Board is respectfully requested to remove all rejections of claims 1-20.

Please charge any deficiencies and/or credit any overpayments necessary to enter this paper to Assignee's Deposit Account number 50-0510.

Respectfully submitted,

Dated: April 27, 2007

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VIII. CLAIMS APPENDIX

Claims, as reflected upon entry of the Amendment Under 37 CFR §1.111 filed on September 6, 2006:

1. (Rejected) A method for monitoring continual range queries against events, said method comprising:

decomposing each range query into one or more predefined virtual constructs;

building a query index; and

using said query index to match an event with said range queries.

2. (Rejected) The method of claim 1, said building of a query index further comprising:

storing an identification of said query with identification lists associated with said virtual constructs.

3. (Rejected) The method of claim 1, said building of a query index further comprising:

predefining a set of virtual constructs for each point being monitored.

4. (Rejected) The method of claim 1, said matching of an event with said range queries further comprising:

finding all the virtual constructs that cover said event.

5. (Rejected) The method of claim 1, said decomposing of a range query further comprising:

initializing a working rectangle to be said range query;

repeatedly cutting a strip rectangle from said working rectangle; and

decomposing said strip rectangle with one or more of said virtual constructs.

6. (Rejected) The method of claim 4, wherein a size of the set of covering virtual constructs of an event is constant for all the event points.

7. (Rejected) The method of claim 4, wherein gaps between corresponding different covering virtual constructs of all event points are identical.

8. (Rejected) The method of claim 4, said finding of all covering virtual constructs of an event comprising:

pre-computing of a difference table;

computing an identification of a pivot virtual construct; and

adding said identification of pivot virtual construct to each of the elements stored in said difference table.

9. (Rejected) A method of providing a service of monitoring events or conditions, said method comprising at least one of the following:

providing a service that monitors events against interests of a customer, said service monitoring said events by decomposing continual range queries related to said customer interests with one or predefined virtual constructs, building a query index, and using said query index to match an event with said range queries;

maintaining one or more customer interests expressed as continual range queries for the service that monitors events; and

notifying a subset of said customers whose interests match an event.

10. (Rejected) A system for monitoring continual range queries against events, said system comprising:

a decomposing module that decomposes each range query into one or more predefined virtual constructs;

a query index construction module; and

an event matching module that uses said query index to match an event with said range queries.

11. (Rejected) The system of claim 10, further comprising:

at least one sensor to detect occurrence of events.

12. (Rejected) The system of claim 10, further comprising:

at least one client input station to permit a client to provide an input query.

13. (Rejected) The system of claim 10, further comprising:

at least one client receiver to permit a client to be notified of occurrence of an event of interest.

14. (Rejected) An apparatus for monitoring continual range queries against events, said apparatus comprising one of:

a query monitor that includes:

a decomposing module that decomposes each range query into one or more predefined virtual constructs;

a query index construction module; and

an event matching module that uses said query index to match an event with said range queries;

a sensor to detect occurrence of events and provides said occurrence of events into said query monitor;

a client receiver to permit a client to be notified of occurrence of an event of interest to said client.

15. (Rejected) A signal-bearing medium tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus to perform a method for monitoring continual range queries against events, said method comprising:

decomposing each range query into one or more predefined virtual constructs;

building a query index; and

using said query index to match an event with said range queries.

16. (Rejected) The method of claim 1, wherein said event is monitored by scanning points in an event space having at least one dimension, and said predefined virtual constructs comprise rectangular objects in said event space.

17. (Rejected) The method of claim 16, wherein dimensional ratios of said predefined virtual constructs are based on powers of 2 relative to a dimension of said event space.

18. (Rejected) The method of claim 1, wherein each said predefined virtual construct is identified as based on a location of a corner of said virtual construct in a monitored region of said event space and at least one dimension of said virtual construct.

19. (Rejected) The method of claim 18, wherein an identification of each said predefined virtual construct is calculated to be an integer, the calculations for said integer being based at least in part on said location and said at least one dimension.

20. (Rejected) The method of claim 1, wherein said decomposing each range to determine said one or more predefined virtual constructs comprises generating a set of working rectangles in an event space that become progressively smaller in size.

IX. EVIDENCE APPENDIX

(NONE)

X. RELATED PROCEEDINGS APPENDIX

(NONE)